

*Schuchmanoceras hamicarinatum*, Gen. Nov., Sp. Nov., a  
Keeled Heteromorph Ammonite from the Cretaceous  
(Albian) of California

by

MICHAEL A. MURPHY

University of California, Davis, California 95616, USA

AND

PETER U. RODDA

California Academy of Sciences, San Francisco, California 94118, USA

**Abstract.** *Schuchmanoceras hamicarinatum*, a new genus and species of Albian (Early Cretaceous) anisoceratid ammonite, is described on the basis of the unique combination of a ventral keel, distinctive sculpture, and anisoceratid coiling. Its late Albian age is established by the contemporaneous ammonite species *Anagaudryceras buddha*, *Pseudouhligella japonicum*, *Stoliczkaia notha*, and *Mesopuzosia colusaense*.

#### INTRODUCTION

A ventral keel is a common morphological feature of planispirally coiled ammonites such as the Upper Albian brancoceratid genera, *Mortoniceras* Meek, 1876, *Hysterocheras* Hyatt, 1900, and *Dipoloceras* Hyatt, 1900. However, in heteromorph ammonites, those forms with whorls not in contact or not planispirally coiled, a ventral keel is extremely rare. In some 150 named genera of lycoceratine heteromorphs, only three have previously been described as having some form of keel; none have been reported in the family Anisoceratidae. We herein describe a keeled heteromorph ammonite with anisoceratid coiling (body chamber in the shape of a hook), and a unique sculpture somewhat similar to that commonly observed in species of *Anisoceras* Pictet, 1854. This combination of features has not been reported previously in the same animal.

Although we have only a single specimen, the unique combination of morphological characters readily distinguishes this form from previously described ammonite genera, and in our judgment is sufficiently distinct to recognize this taxon as new at the generic level. In this we follow traditional morphologically based ammonite systematics. Phylogenetic classifications, while much needed for ammonites, are, in our opinion, still far away, and will require ontogenetic studies of well-preserved specimens with good stratigraphic control.

#### SYSTEMATIC PALEONTOLOGY

Mollusca

Cephalopoda

Ammonoidea

Family ANISOCERATIDAE Hyatt, 1900

Genus *Schuchmanoceras* Murphy & Rodda, gen. nov.

**Type species:** *Schuchmanoceras hamicarinatum* Murphy & Rodda, sp. nov.

**Derivation of the name:** In honor of Clarence Schuchman, in recognition of his many contributions to the study of Cretaceous ammonites of California.

**Diagnosis:** A keeled heteromorph ammonite with anisoceratid coiling and strong ribs that are joined in pairs by a clavate lateral tubercle.

*Schuchmanoceras hamicarinatum* Murphy & Rodda, sp. nov.

(Figures 1-4)

**Holotype:** California Academy of Sciences Geology Type Collection CASG 66819.01.



**Derivation of the name:** From Latin *hami*, hook + *carina*, keel, hence, keeled hook.

**Diagnosis:** As for genus.

**Material:** One specimen consisting of deformed segments of shaft and hook.

**Locality:** North Fork of Cottonwood Creek, Ono quadrangle, 1/25,000, Shasta County, California. CASG Cottonwood Project, section NF Vla, at Stake 482 (Figures 5, 7). Upper part of Chickabally Mudstone Member, Budden Canyon Formation (Murphy, et al., 1969).

**Description:** Partial phragmacone of short (30 mm) section of shaft with clavate lateral tubercle elongate parallel to shaft; remaining shaft and hook comprise body chamber; dorsum smooth; cross section oval, slightly higher than wide; widely spaced, sharp-crested, curved ribs, mostly joined in pairs at midflank by clavate tubercle (spine base), from which they pass peripherally in a strong adapically directed curve; ribs die out ventrally near sharp ventral keel; one or two weak interribs between clavate with reverse sigmoidal curvature, commonly weaker at midflank; on latter part of body chamber tubercles more equant, and keel not apparent on poorly preserved venter. Segments of suture line visible on crushed and deformed partial phragmacone: E, part of first lateral saddle, and peripheral (?) half of L (Figure 6).

**Measurements:** Overall length of preserved specimen 175 mm; distance between shaft and body chamber 32–37 mm; height of the shaft 25 mm, width 21 mm; height of the body chamber near aperture 40–43 mm. Measurements approximate; specimen deformed by compaction, and parts somewhat rotated.

**Discussion:** This specimen, assigned to the family Anisoceratidae principally on the basis of its hooked shape and partial suture, is unique among anisoceratid heteromorphs in its distinctive ribbing and the presence of a keel on at least the earlier parts of the preserved shell. The small fragments of the septal suture line and the septal face partially preserved suggest an anisoceratid pattern like that found in the type species, *Anisoceras saussureanus* Pictet, 1847 (see also Spath, 1938, pp. 542, 552; Wright, 1957, p. L219).

The only other described keeled heteromorphs are *Phlycticrioceras* Spath, 1926, from the Coniacian of Europe and North America, *Prophlycticrioceras* Clark, 1965, from the Upper Albian of Texas, and *Boehmoceras* Riedel, 1931, from the Coniacian of Germany. These three genera (with *Boehmoceras* included questionably) constitute the family Phlycticrioceratidae (Spath, 1926; Wright, 1957; Clark, 1965). *Phlycticrioceras* and *Prophlycticrioceras* are generally similar and have a row of siphonal tubercles that in some specimens coalesce to form serrated keels; *Prophlycticrioceras* has broader ribs with fine intermediaries and a broader whorl section. Both of these genera resemble the anisoceratid genera *Idiohamites* Spath, 1925, and *Allocrioceras* Spath, 1926, in general shape, uniform ribbing, and ventro-lateral nodes, but with the addition of siphonal tubercles or serrate keel. *Schuchmanoceras*, by contrast, has a solid keel in the parts preserved, and the ornament is distinctly different, with clavate nodes elongate parallel to the shaft and strong, widely spaced, looped ribs connected in pairs to the nodes. This rib pattern is somewhat reminiscent of the “button and loop” rib pattern in some species of *Anisoceras*, but in that genus the nodes are smaller and equant, and the looped ribs, which are finer and much more narrowly spaced, connect paired ventro-lateral nodes, and additional loops extend to the dorso-lateral nodes. In *Anisoceras* the ribbing generally is finer and denser than in *Schuchmanoceras*. The “button and loop” pattern appears in *Anisoceras perarmatum* Pictet & Campiche, 1861, *A. armatum* (J. Sowerby, 1817), *A. phillipsi* Cooper & Kennedy, 1979, *A. haasi* Cooper & Kennedy, 1979, and in at least one species of *Protanisoceras* Spath 1923, *P. raulinianum* (d’Orbigny, 1842). See Spath (1938) and Cooper & Kennedy (1979) for illustrations and descriptions of these species and other anisoceratids.

*Boehmoceras* is characterized by a loose, open, expanding coil mainly in one plane, but without a hook or straight final shaft typical of *Anisoceratidae*. Compared with the ovate cross section of *Schuchmanoceras*, the whorl section of *Boehmoceras* is narrower with compressed, weakly inflated flanks and acutely tapered venter. Ornament on *Boehmoceras* consists of coarse, widely spaced, strongly curved ribs, bearing weak or no ventro-lateral nodes, and splitting ventrally into secondary ribs, which extend over the venter, forming weak serrations on the solid keel (Rie-

←

#### Explanation of Figures 1 to 4

Figure 1. *Schuchmanoceras hamicarinatum* Murphy & Rodda, gen. nov., sp. nov. Oblique view of shaft to show keel. CASG 66819.01. Length, 75 mm.

Figure 2. *Schuchmanoceras hamicarinatum* Murphy & Rodda, gen. nov., sp. nov. Lateral view of body chamber and small segment of shaft (lower left). CASG 66819.01. Maximum length, 175 mm; shaft length, 30 mm.

Figure 3. *Schuchmanoceras hamicarinatum* Murphy & Rodda, gen. nov., sp. nov. Lateral view of section of Figure 1 to show ornamentation on flank. CASG 66819.01. Length, 75 mm.

Figure 4. *Schuchmanoceras hamicarinatum* Murphy & Rodda, gen. nov., sp. nov. Oblique view of hook to show ribbing and keel. CASG 66819.01. Maximum height of flank, 30 mm.



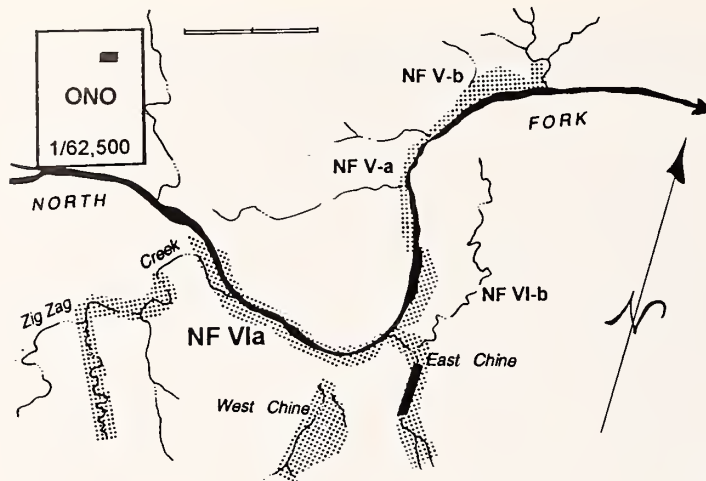


Figure 5

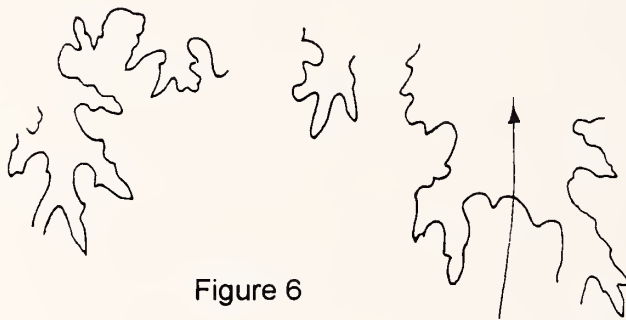


Figure 6

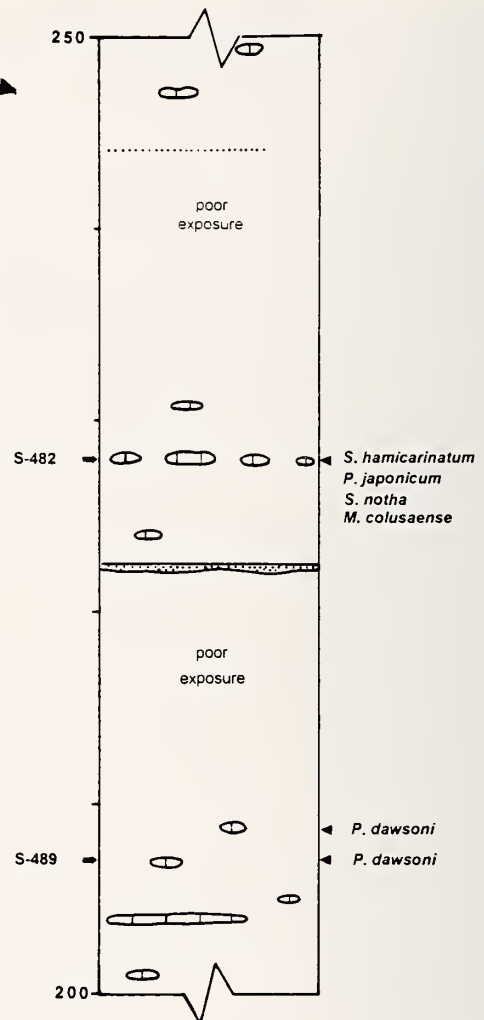


Figure 7

Explanation of Figures 5 to 7

Figure 5. Location map. Area of Figure 5 shown as black rectangle in inset of Ono quadrangle (1/62,500). Stippling indicates location of several measured stratigraphic sections. *Schuchmanoceras hamicarinatum* Murphy & Rodda, gen. nov., sp. nov., was found in upper part of section NF VIa in East Chine. Section NF VIa extends along North Fork of Cottonwood Creek from its base near the mouth of Zig Zag Creek to East Chine and up East Chine and its southern branch. Location of columnar section of Figure 7 indicated by thick line along East Chine. Scale bar 500 m long.

Figure 6. Partial suture of last septum of shaft of Holotype of *Schuchmanoceras hamicarinatum* Murphy & Rodda, gen. nov., sp. nov., CASG 66819.01.

Figure 7. Columnar section of upper part of section NF VIa (upper Chickabally Mudstone Member, Budden Canyon Formation) showing stratigraphic positions of *Schuchmanoceras hamicarinatum* Murphy & Rodda, gen. nov., sp. nov., and associated fossils, *Pseudouhligella japonicum* (Yabe, 1904), *Stoliczkaia notha* (Seeley, 1865), *Mesopuzosia colusaense* (Anderson, 1902), and *Pseudouhligella dawsoni* (Whiteaves, 1900). S-482 and S-489 indicate position of numbered stakes. Numbers at top and bottom of column indicate thickness in feet (200 ft. = 60.9 m; 250 ft. = 76.2 m). Lithologic symbols: Dots = sandstone, ovoids = limestone nodules, blank areas = mudstone.

del, 1931). In *Schuchmanoceras*, ribs are curved in a loop fashion and extend only from the flank clavae toward the venter, except on the outer part of the body chamber where ribs extend across the entire flank.

**Age and correlation:** The specimen was found in a stratigraphic interval that has also yielded *Anagaudryceras buddha* (Forbes, 1846), *Mesopuzosia colusaense* (Anderson, 1902), *Pseudouhligella japonicum* (Yabe, 1904), and *Sto-*

*liczkaia notha* (Seeley, 1865) (Figure 7). The latter species, recently reviewed by Wright & Kennedy (1994), suggests a correlation with the Upper Albian *dispar* Zone of Owen (1989) or the *perinflatum* Zone of Amédro (1992).

#### ACKNOWLEDGMENTS

The authors' research has been supported by the National Science Foundation. We also appreciate the advice of Jean-Louis Latil on some of the identifications and stratigraphic position of the fauna. The photographic work was done by Mary Graziose, University of California, Davis.

#### LITERATURE CITED

- AMÉDRO, F. 1992. L'Albien du bassin Anglo-Parisien: ammonites, zonation phylétique, séquences. Bulletin Centres Recherche, Exploration-Production Elf-Aquitaine 16(1):187-233.
- ANDERSON, F. M. 1902. Cretaceous deposits of the Pacific Coast. Proceedings of the California Academy of Sciences 4(23):1-34.
- CLARK, D. L. 1965. Heteromorph ammonoids from the Albian and Cenomanian of Texas and adjacent areas. Memoirs of the Geological Society of America 95:1-99.
- COOPER, M. R. & W. J. KENNEDY. 1979. Uppermost Albian (*Stoliczkaia dispar* zone) ammonites from the Angolan littoral. Annals of the South African Museum 77(10):175-308.
- D'ORBIGNY, A. 1840-42. Paléontologie française. Terrains crétacés I. Céphalopodes. Paris. 662 pp.
- FORBES, E. 1846. Report on the Cretaceous fossil invertebrates from southern India, collected by Mr. Kaye and Mr. Culliffe. Transactions of the Geological Society of London (2): 97-174.
- HYATT, A. 1900. Cephalopoda. Pp. 502-604 in C. R. Eastman (transl. and ed.), K. A. von Zittel, Text-book of Paleontology, vol. 1. Macmillan: New York.
- MEEK, F. B. 1876. A report on the invertebrate Cretaceous and Tertiary fossils of the upper Missouri Country. Pp. 1-629 in F. B. Meek and F. V. Hayden, United States Geological and Geographical Survey of the Territories, volume 9.
- MURPHY, M. A., P. U. RODDA & D. M. MORTON. 1969. Geology of the Ono quadrangle, Shasta and Tehama Counties, California. Bulletin of the California Division of Mines and Geology 192:1-28.
- OWEN, H. 1989. Late Albian (*Stoliczkaia dispar* Zone) ammonites from Misburg, Hannover. Geologisches Jahrbuch A 113:373-395.
- PICTET, F. J. 1847. Pp. 257-412 in F. J. Pictet and W. Roux, Description des mollusques fossiles qui se trouvent dans les Grès Verts des environs de Genève. Memoires Societe physique et historie naturelle Genève 11(2).
- PICTET, F. J. 1854. Traité de Paléontologie (2nd. ed.) 2, Céphalopodes. Paris. Pp. 583-716.
- PICTET, F. J. & G. CAMPICHE. 1860-64. Description des fossiles du terrain crétacé des environs de Ste. Croix. Matériaux pour la Paléontologie Suisse 3 (1860-64):1-725.
- RIEDEL, F. 1931. Zur Stratigraphie und Faciesbildung im Obereemscher und Untereemscher am Südrande des Beckens von Münster. Jahrbuch Preussischen Geologischen Landesanstalt 51(2):605-713.
- SEELEY, H. G. 1865. On ammonites from the Cambridge Greensand. Annals and Magazine of Natural History (3)16: 225-247.
- SOWERBY, J. 1817. Mineral Conchology of Great Britain, vol. 2. Meridith: London. Pp. 1-245.
- SPATH, L. F. 1923. Excursion to Folkestone, with notes on the zones of the Gault. Proceedings of the Geologists Association 34:70-76.
- SPATH, L. F. 1925. On Upper Albian ammonoidea from Portuguese East Africa, with an appendix on Upper Cretaceous ammonites from Maputoland. Annals of the Transvaal Museum 11:179-200.
- SPATH, L. F. 1926. On the zones of the Cenomanian and uppermost Albian. Proceedings of the Geologists Association 37:420-432.
- SPATH, L. F. 1938. A monograph of the ammonoidea of the Gault, XIII. Palaeontographical Society. Pp. 541-608.
- WHITEAVES, J. F. 1900. On some additional or imperfectly understood fossils from the Cretaceous rocks of the Queen Charlotte Islands, with a revised list of the species from these rocks. Geological Survey of Canada, Mesozoic Fossils 1(4): 263-307.
- WRIGHT, C. W. 1957. Part L Mollusca, Cephalopoda, Mesozoic Ammonoidea superfamily Turrititaceae. Pp. L214-L228 in R. C. Moore (ed.), Treatise on Invertebrate Paleontology. University of Kansas and Geological Society of America.
- WRIGHT, C. W. & W. J. KENNEDY. 1994. Evolutionary relationships among *Stoliczkaia* (Cretaceous ammonites) with an account of some species from the English *Stoliczkaia dispar* Zone. Cretaceous Research 15(5):547-582.
- YABE, H. 1904. Cretaceous cephalopoda from Hokkaido, part 2. Journal of the College of Science, Imperial University, Tokyo 20(2):1-45.